**Date\_10/24/12 Time 7:20 Subject Active & Bulk Transport Grade\_10\_**

**Pennsylvania/National Standards:**

* Keystone Anchor
  + BIO.A.2.2: Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e. atoms, molecules, and macromolecules)
* PDE SAS
  + S11.A.3.2.3 Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of the solar system, life spans, size of atomic particles, topographic maps).
  + S11.A.1.1.5: Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars).
  + S11.B.1.1.1: Explain how structure determines function at multiple levels of organization (e.g., chemical, cellular, anatomical).
  + S11.B.1.1.3: Compare and contrast cellular processes (e.g., photosynthesis and respiration, meiosis and mitosis, protein synthesis and DNA replication).
* National Science Education Standards
  + Standard C 1.1: Cells have particular structures that underlie their functions. Every cell is surrounded by a membrane that separates it from the outside world. Inside the cell is a concentrated mixture of thousands of different molecules which form a variety of specialized structures that carry out such cell functions as energy production, transport of molecules, waste disposal, synthesis of new molecules, and the storage of genetic material.

**Essential Understanding(s)/Key Concepts/Skills:**

* Active transport involves moving substances into and out of the cell using methods that require the cell to use energy.
* The sodium-potassium pump, endocytosis, and exocytosis are forms of active transport

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| **Instructional Objectives** | **Aligned Assessments** |
| 1. Given a graphic organizer, the student will compare/contrast the types of active transport with 80% accuracy.  2. Given a list of types of active transport, the student will identify and explain them with 80% accuracy. | 1. Graphic organizer.  2. Mid-term exam questions, Unit project |

**Review of Skills/Content:**

The information learned in the previous lesson regarding the cell membrane will be reviewed before this lesson. Students will need to recall the information they learned about the structure of the cell membrane and its functions. The students will be finishing the gummy bear osmosis/diffusion lab that they started on day 2, so this information should be reviewed as well.

**Materials:**

* Teacher computer
* Active transport PowerPoint
* Student notes handouts
* Active transport graphic organizer handout
* Student gummy bear activity handouts (from day 2)
* Student gummy bears (from day 2)
* Paper towels
* 6 rulers
* Balance

**Behavioral Expectations:**

Students will be expected to follow all posted school and classroom rules. Students will be expected to pay attention to the teacher and respect the teacher and classmates at all times. Since the students will be working in groups, they will be expected to actively participate in group work while maintaining focus and staying on-task. Students will also be expected to clean up their lab areas after the activity. Students will be expected to actively take notes during the PowerPoint presentation.

**Methods of Assessment:**

The lesson objectives will be formatively assessed during the lesson through the use of informal questioning. At the end of the lesson, the teacher will do a visual check for completion of the students’ graphic organizers. There will also be questions regarding the information learned in this lesson on the unit exam. The lab activity sheets will be collected upon completion of the activity and assessed by the teacher.

**General/Specific Accommodations for Students (Diverse/English Language Learners):**

In order to accommodate English language learners and students with special needs, access to classroom aides such as textbooks will be provided so students may look up words they are unfamiliar with. The instruction will be delivered clearly and concisely. Responses to questions may be modeled and extra time may be given to complete assignments. Students will be allowed to work in groups and may be allowed to hand in a single lab sheet for the entire group. The lab handouts and notes will be read aloud to aid students with visual impairments and copies of pre-filled note sheets may be provided if necessary.

**Instructional Sequence:**

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| **Lesson Implementation** | **Anticipated Student Responses** |
| **Introductory Activity (Anticipatory Set):**  The anticipatory set will include a set of Keystone exam vocabulary words that relate to the lesson including active transport, endocytosis, and exocytosis. The students will be given approximately 10 minutes to define these terms by looking up the definition in their textbooks.  The class will then review the daily objectives which will be written on the board. | Once the students arrive in the classroom, they will be expected to sit down, take out their books and notebooks, copy down the vocabulary words, and write definitions for them in their notebooks.  The students may not begin to work on their vocabulary right away, so it will be important for the teacher to keep them on task. |
| **Modeling/Demonstration:**  To begin the modeling/demonstration, the teacher will gain the students’ attention by passing out guided note handouts and starting the notes PowerPoint. The PowerPoint will guide the students through the types of active transport, including sodium-potassium pumps, endocytosis, and exocytosis. The teacher will demonstrate how the students will identify the missing words from their handouts and insert the proper terms from the PowerPoint presentation slides. | During the modeling/demonstration, it is expected that the students will follow the instruction and pay attention to the instructor. Some students may lack attention so it will be important for the instructor to make sure to maintain student focus during this time.  The students should copy all of the PowerPoint notes onto their notes sheets. Depending on the level of the students and based on teacher discretion, the teacher may perform a notebook check in order to make sure the students have copied down all of the required information.  Some students may not participate in note-taking and may not maintain focus on the PowerPoint. The teacher should try to keep the students focused by making the notes interesting. |
| **Guided Practice/Feedback:**  The teacher will then hand out the active transport graphic organizers to the students and ask them to use their notes to help them fill in the important information for each type of active transport.  Once the students have completed their graphic organizers, they will be moved into their lab groups and asked to share their organizers with their group mates. This will give them a chance to get feedback on their organizers and correct any mistakes they may have.  Student attention will then be called back to the teacher who will ask students to share what they placed in each spot of the graphic organizer so that the class as a whole can collaborate and correct the graphic organizers. | The students should fully participate in the guided practice and to use the feedback provided by the teacher to guide their learning and help them understand the concepts being taught.  Some students may not participate in the discussions, so it will be important for the teacher to elicit responses by asking students who agree with the statements other students made to raise their hand or some other form of response.  Moving the students into groups could cause some of them to get off-task. The teacher will have to closely monitor the students during this time to ensure a smooth transition. |
| **Independent Practice:**  After the students have completed their graphic organizers, the teacher will do a quick visual check for completeness. The teacher will then hand out the gummy bear osmosis/diffusion activity sheets from day 2 and ask one student from each group to get all of the required supplies.  During this lesson, the students will follow the instructions on the handout to finish the activity. The students will then answer discussion questions at the end of the lab activity in order to help further their understanding of cellular transport mechanisms. | The students will be expected to participate fully in the activity with the members of their group and to keep the lab area as clean as possible.  Some students may not want to participate in the activity. The teacher will have to make sure all students are participating equally and sharing ideas.  Some students may make a mess of the lab area when doing their lab activity. The teacher will have to supply paper towels for the students to clean up the area when they are done. |
| **Discussion/Essential Questions:**   * What is active transport? * What are some examples of active transport? * Why is active transport important for cells? | The students should be able to answer these essential questions by the end of the lesson. |
| **Formative Assessment:**  The formative assessment for this lesson will consist of the students’ answers to informal questioning throughout the lesson as well as their completed lab handout which they will turn in at the end of the period. The graphic organizers will also be a formative assessment. The information gained from these assessments will allow the teacher to make sure students understand the key concepts being covered in the lesson and adapt future lessons. |  |
| **Closure (Review/Preview):**  To close this lesson, the students will be asked to share the results from their gummy bear lab activity and to relate their results to the types of cellular transport that have been covered over this unit. This will provide the students an opportunity to think about all of the information they learned throughout the lesson and put it all together. | The students should participate in the discussion and should provide their own unique input. They should also think critically about the information they learned over the course of the unit so far. Some students may not participate, so the teacher should guide them into discussion by asking if they agree or disagree with other students. |
| **Extension Activities:**  The extension activity that will be used if the lesson is finished before the end of the period will consist of giving the students pieces of paper and asking them to create vocabulary flash cards for the terms covered in the lesson and then review them with their partners. | The students should maintain focus while completing this activity, but some may lose focus since the period will be almost over. The teacher will need to help maintain student focus. |

**Correction Procedures/Potential Areas of Difficulty:**

The content of this lesson may confuse students because in order to discuss active transport, you need to also discuss ATP, which the students have not yet covered. It will be important to give the students enough background information regarding the use of ATP by cells as a form of energy that they can understand that active transport requires the use of ATP and thus the use of energy by the cell. The students may also be confused with the differences between active and passive transport, so it will be important to reinforce the idea that active transport requires the cell to use energy while passive transport does not.

**Summative Assessment:**

**Assessment Items**

1. The sodium-potassium pump requires energy to move sodium and potassium ions across the cell membrane. Which of these describes the process used by the sodium-potassium pump?
   1. Osmosis
   2. Diffusion
   3. Active transport
   4. Photosynthesis
2. What is the function of the proteins in the cell membrane?
   1. Cellular respiration
   2. Cell transport
   3. Photosynthesis
   4. Communication
3. The concentration of calcium in a cell is 0.3%. The concentration of calcium in the fluids surrounding the cell is 0.1%. How could the cell obtain more calcium?
   1. Diffusion
   2. Osmosis
   3. Active transport
   4. Facilitated diffusion
4. Which of the following pieces of evidence would suggest that a substance entered a cell via active transport as opposed to passive transport?
   1. ATP was required for transport
   2. The substance moved across the membrane via a carrier protein
   3. The substance moved from a high concentration to a low concentration
   4. None of the above
5. When active transport is used to move molecules, what is required?
   1. Concentration gradient
   2. Very small molecules
   3. Energy provided by the cell
   4. Osmosis
6. The process of transporting materials that dissolve in water into the cell (cell drinking) is known as
   1. Pinocytosis
   2. Phagocytosis
   3. Exocytosis
   4. Osmosis
7. The process of releasing large molecules out of the cell is called
   1. Pinocytosis
   2. Phagocytosis
   3. Exocytosis
   4. Osmosis

**Answers and Scoring Criteria**

1. C (1 point)
2. B (1 point)
3. C (1 point)
4. A (1 point)
5. C (1 point)
6. A (1 point)
7. C (1 point)

\*Also, see final unit project handouts in lesson 8\*

**Modified Assessment Items for Students with Disabilities and English Language Learners:**

1. The sodium-potassium pump requires energy to move sodium and potassium ions across the cell membrane. Which of these describes the **process used by the sodium-potassium pump**?
   1. Osmosis
   2. Diffusion
   3. Active transport
2. What is the **function of the proteins** in the cell membrane?
   1. Cellular respiration
   2. Cell transport
   3. Photosynthesis
3. The concentration of **calcium in a cell is 0.3%.** The concentration of calcium in the fluids **surrounding the cell is 0.1%.** How could the cell **obtain more** calcium?
   1. Diffusion
   2. Osmosis
   3. Active transport
4. Which of the following pieces of evidence would suggest that a substance entered a cell via **active transport** as opposed to passive transport?
   1. ATP was required for transport
   2. The substance moved across the membrane via a carrier protein
   3. The substance moved from a high concentration to a low concentration
5. When **active transport** is used to move molecules, what is required?
   1. Concentration gradient
   2. Very small molecules
   3. Energy provided by the cell
6. The process of **transporting materials that dissolve in water** into the cell (**cell drinking**) is known as
   1. Pinocytosis
   2. Phagocytosis
   3. Exocytosis
7. The process of **releasing large molecules** out of the cell is called
   1. Pinocytosis
   2. Phagocytosis
   3. Exocytosis

**Reflections:**

**Sources:**

Melgaard, K. (n.d.). Investigating osmosis using water and gummy bears. *SERC*. Retrieved October 6, 2012, from <http://serc.carleton.edu/sp/mnstep/activities/26990.html>